Abstract of the Disclosure

A stir-friction hot-working or welding arrangement uses a pin tool having a ligament 22 and a shoulder 224. The force required for incremental penetration increases markedly when the shoulder is reached. A control system for maintaining a set penetration depth includes a load cell for measuring force or pressure applied to the pin tool. The control system compares a reference signal representing the desired force with the actual force from the load cell, to produce an error signal which controls the penetration force, thereby tending to maintain a desired penetration depth. In a particular embodiment, the reference signal ramps up from a low or zero value at turn-on, to reduce forces applied upon initial penetration. In another embodiment, position signals are used to control a modulator or multiplier, which changes the error signal applied at certain positions of penetration, or at certain velocities of penetration.